

*QUANTITATIVE HIGH RESOLUTION ELECTRON MICROSCOPY OF GRAIN BOUNDARIES**Geoffrey H. Campbell and Wayne E. King**Chemistry and Materials Science Directorate**University of California, Lawrence Livermore National Laboratory, Livermore CA 94550-9900.*

Diffusion bonding precisely oriented single crystals is a useful technique for producing model grain boundaries in a variety of materials, including metals, alloys, and ceramics. When performed in an ultra-high vacuum environment, the high purity of the single crystals is maintained. These types of grain boundaries are well suited to atomic structure characterization by high resolution transmission electron microscopy. The high quality of the images lends itself to the determination of the electron optical imaging parameters by non-linear least squares optimization of the image simulations. Comparisons can then be made to atomic models created by geometric construction to form the Coincident Site Lattice model boundary or by atomistic simulations. The model structures are used in high resolution image simulation and comparisons to the experimental images can likewise be made in a quantitative manner. Many aspects of the boundary structures are properly represented by the models, but some details of high resolution images indicate that differences exist indicating room for improvement of the modelling.

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